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MICROPALAEONTOLOGICAL EXAMINATION OF ROCK SAMPLES
FROM THE CENTRAL HIGHLANDS, NEW GUINEA.

by

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INTRODUCTION

A large collection of rocks from the Central Highlands of New Guinea was submitted by N. J. McMillan and J. E. Johnson for micropalaeontological examination. Two reports have been made previously on some samples from the region and all results are gathered in the present one.

The samples were collected from four areas:

- A. Vicinity of Watabung, 20 miles east of Chimbu.
- B. South and east of Bena Bena, east end of Goroka Valley.
- C. Asaro-Daulo Area, west end of Goroka Valley.
- D. Bundi Area, on Ramu Fall on north side of Bismarck Mountains.

The microfaunas of each of these areas are discussed separately.

Many of the rock samples were limestones and more than 150 sections were prepared and examined. Other samples were studied from polished surfaces. Siltstones and greywackes were crushed and washed for examination.

Faunas of Upper Cretaceous, Eocene, Lower Oligocene and Miocene ages were determined. A large number of them contained planktonic foraminifera which, unless they were associated with rocks of determinable age, could not be given an exact age. The collection included many unfossiliferous rocks and some in which the fauna was too poorly preserved for age determination.

A map showing sample localities is attached.

DETAILED EXAMINATION OF SAMPLES

A. Watabung Area

Forty-two samples were examined from the Watabung area. The rock types included limestone, greywacke, calcareous

siltstone, sandstone and fossiliferous conglomeratic pebbles. Upper Cretaceous, Eocene and Miocene faunas were recognised. Many samples were unfossiliferous or contained such poor faunas that no age could be determined.

1. Upper Cretaceous.

The following samples were Upper Cretaceous in age: M44a, 3M15a, 3M15b, 3M15c, 3M18a, J54b.

- (a) Samples M44a, 3M18a, 3M15a and J54b contained the Upper Cretaceous larger foraminiferal genus Pseudorbitoides, the species being tentatively referred to P.israeliskii Vaughan and Cole.
- (b) Samples 3M15b, 3M15c and 3M15d contained many small tests of the planktonic form Globotruncana, mainly referable to the species G.lapparenti Brotzen.

The presence of G.lapparenti suggests an Upper Senonian (Campanian) age for these Upper Cretaceous rocks.

2. Eocene pebbles from Conglomerates.

Samples M43a, M47a, and 2J5b, which are pebbles from conglomerates, contained an Eocene fauna. No evidence is available for determining the exact age of the conglomerates.

Species identified were Nummulites bagelensis, Discocyclina douvillei, Actinocyclina aster, Pellatispira cf.glabra, P.madaraszi var. provalei, Alveolina sp., and cf. Halkyardia.

3. Miocene.

- (a) Samples 3M17b and 2J5c are pebbles from conglomerates. They contained an "e" stage (Upper Oligocene to basal Lower Miocene) fauna but no evidence as to the age of the conglomerate is available. The foraminifera recognised were Spiroclypeus orbitoides, Miogypsinoidea dehaertii, Lepidocyclina (Eulepidina) sp.1, L.(Nephrolepidina) angulosa and L. (N.) cf. parva, this assemblage suggesting that the beds were laid down in the early part of "e" stage.
- (b) Upper Lower Miocene (f₁-f₂ stage). The following samples are included here: M50b, M50d, M53a, 3J3e, J67a, J68a, J70c, J71b, J71c, J72c, J72f, 2J3b, 3J3b, 3J3c, 3J3d, 3J3f, 3J3g. Two assemblages are characteristic of these specimens:
 - (i) Lepidocyclina and Miogypsina are prominent in M50b, M50d, J70c, J71c, J72c, J72f, 2J3b. The species recognised were: L.(N.) angulosa, L.(N.) sumatrensis, L. (N.) parva, L. (T.) verrucosa, Miogypsina kotoi, M.polymorpha, M.mamillata. Austrotrillina howchini was present in M50d and well preserved specimens of Katacycloclypeus annulatus in J72c.
 - (ii) Operculinella and Miogypsina are associated in the following samples: M53a, J71b, 3J3c,

3J3d, 3J3e, 3J3f, 3J3g. In Records 1956/100 only Operculinella was recorded in J67a and J68a, those rocks being considered to be "g" stage, Upper Miocene. However, in later samples, tests of Miogypsina were found associated with numerous tests of Operculinella thus indicating "f₁-f₂" stage.

4. Globigerina-bearing rocks. M42a, M51b, and 3M16a contained abundant Globigerinidae. No associated fauna is known and consequently the age of these three rocks is indefinite.

5. Rocks of unknown age. Because of the poor faunas present or because of the absence of fossils, no age could be assigned to the following samples: M34a, M34b, M39a, M51a, M55a, M54b, 3M16b, 3M16c, 3M17a, J70a.

B. Bona Bona Area.

Forty samples were examined from this area. The rock types included sandstone, siltstone, mudstone, limestone, greywacke, and conglomerate. Upper Cretaceous, Eocene, Lower Oligocene and Miocene faunas were recognised.

1. Upper Cretaceous.

The following samples were Upper Cretaceous in age: 2M51b, 2M52a, 2M55a, 2J70h, 2J70i, 2J71a.

- a. Sample 2M52a contained the Upper Cretaceous larger foraminiferal genus Pseudorbitoides.
- b. 2M51b, 2M55a, 2J70h, 2J70i and 2J71 contained numerous tests of Globotruncana. Washings of sample 2M51b contained the following Upper Cretaceous forms - Globotruncana stuarti, Neoflabellina sp. and Dorothia cf. bulletta suggesting that it is possibly Maestrichtian. Although determinable species were not present in the other samples, they are most probably high in the Upper Cretaceous.

2. Eocene.

The following samples are Eocene in age: 2M55b, 3M5b, 2M54a, 2M54b, 2M55c, 2M55d, 2M61a, 2M68a, 3M10a, 3M18b, 3M19a.

- a. Samples 2J73a, 2M54a, 2M54b, 2M55b, 2M55c, 3M18b, 2M55d, 3M19a, contained Nummulites and Discocyclina, species recognised being Nummulites bagelensis, Actinocyclina aster, and Discocyclina cf. pratti. Discocyclina was associated with abundant tests of Globigerina in 3M19a. 3M10a contained an unusual assemblage of arenaceous species together with small tests of Discocyclina.
- b. Globigerina-bearing rocks. Sample 2M68a contained abundant tests of Globigerina. Field evidence indicates that it came from the same bed as 3M18b and 3M19a and must, therefore, be of Eocene age.

3. Lower Oligocene, "c" stage.

Samples 2M62a, 2M62bb, 2M65a contained the Lower Oligocene "c" stage index form Nummulites intermedius.

4. Miocene.

- a. Basal Lower Miocene, "e" stage. Samples 2M43b, 2M61b and 2M62aa contained typical "e" stage forms such as Spiroclypeus margaritatus and Lepidocyclina (Eulepidina) sp.
 - b. Upper Lower Miocene, "f₁-f₂" stage.* Three samples 2J71d, 2J74d and 2M59b contained fragments of calcareous algae and of Lepidocyclina and Cycloclypeus, together with numerous planktonic foraminifera.
5. Rocks of unknown age. Rocks for which no age determination can be given are: 2J68b, 2J68bb, 2J69a, 2J70c, 2J70f, 3J1b, 3J1c, 2M50a, 2M52c, 2M53a, 2M53b, 2M55e, 2M58c.

C. Asaro-Daulo Area.

Thirty samples were examined from this area, the rock types including limestone, shale greywacke, calcareous sandstone and siltstone. Lower Oligocene and Miocene faunas were recognised.

1. Lower Oligocene, "c" stage.

Two samples, S4b and M63a, contained the "c" stage index form, Nummulites intermedius.

2. Upper Oligocene to basal Lower Miocene, "e" stage.

Samples M59a, M61a and 2J35d contained typical "e" stage foraminifera including Spiroclypeus margaritatus, Lepidocyclina (Eulepidina) cf. insulaenatalis, L. (Nephrolepidina) cf. sumatrensis var. inornata, Neoalveolina pygmaea, Gypsina howchini and Miogypsinoidea dehaartii as well as abundant planktonic foraminifera.

Numerous tests of Operculinella were present in M45a and 2M15b. The lithology and fauna are similar to those in which Miogypsina was found associated with Operculinella in the Watabung area. However, these samples are closely associated in the field with "e" stage rocks. At the moment it is not possible to prove whether these rocks are referable to "e" stage or are the same age as the specimens from the Watabung area.

3. Globigerina-bearing rocks. The following samples contained abundant planktonic foraminifera only: 2J11a, 2J12a, 2J35b, 2J43a, M60a, 2M13b, 2M16a, 2M16c, 2M17b. They are associated with both "e" stage and "f₁-f₂" stage rocks.

4. Rocks of unknown age: No age could be assigned to the following samples: M3a, M60b, M62a, M65a, 2M5a, 2M13a, 2M16b, 2M16d, 2M19a, 2M22a, 2M22b, 2M32a, 3M14b, 3M14a, M66a.

D. Bundi Area.

Forty six samples were examined from the Bundi area. The rock types were limestone, conglomerate, greywacke, grits, shaley limestone, calcareous shale and siltstone. Faunas of Upper Cretaceous, Eocene and Miocene age have been recognised.

1. Upper Cretaceous.

The following samples contained Globotruncana: J34a, M25b, S11c, S11d, S11e, S12a. No specific determinations could be made.

* Samples 2J73a and 3J5b which contain abundant Globigerinidae are, on field evidence, also of this age.

2. Eocene.

The following samples are Eocene in age: J19a, M18c, 2M73a, 3M9a. They contained fragments of tests of Nummulites and Discocyclina, those in M18c being very distorted.

3. Upper Oligocene to basal Lower Miocene. "e" stage.

The following samples contained a typical "e" stage fauna: S16b, J26e, J27b, J28a. The species recognised were Spiroclypeus margaritatus, S. orbitoides, Lepidocyclina (Eulepidina) cf. murrayana, L. verbeeki.

Sample J27a contained a few poorly preserved tests of Operculinella and is possibly similar to the rocks from other areas which contained abundant tests of this form. This sample is closely associated with "e" stage rocks. Lithologically, the rock resembles those in which Miogypsina has been found associated with Operculinella but it directly overlies "e" stage rocks. Up to the present no fossiliferous beds have been found overlying rocks of this type and it is not known whether they should be placed in "e" stage or in "f₁-f₂" stage.

4. Globigerina-bearing rocks. The following samples contained abundant Globigerina: 3M6a, 3M6b and S16c. 3M6a is probably "e" stage because of its association with rocks of this age. S16c is a very sheared limestone and is most probably "e" stage. The age of 3M6b is uncertain.

5. Rocks of unknown age. No age could be assigned to the following samples: S11b, S12b, S14b, S22e, S25a, S27c, J18d, J22d, J23a, J24c, J28b, J29b, J32a, J33a, J34c, J35a, J36a, J36b, J37a, J39a, M16a, M18b, M19a, M22a, M28b, 3M8a, J29a.

CONCLUSIONS

The distribution of characteristic foraminifera in samples from the following areas is shown in the table below.

1. Watabung
2. Bena Bena
3. Asaro-Daulo
4. Bundi

Age	Foraminifera	1	2	3	4
Miocene	a. <u>Lepidocyclina</u>				
	<u>Cycloclypeus</u>	x	x	-	-
"f ₁ -f ₂ "	<u>Katacycloclypeus</u>				
	<u>Miogypsina</u>				
	b. <u>Operculinella</u>	x	-	x	x

"e" stage	a. <u>Spiroclypeus</u>				
	<u>Miogypsinoïdes</u>	x	x	x	x
	<u>Lepidocyclina</u>				
	(<u>Eulepidina</u>)				
	b. <u>Operculinella</u>	x	-	x	x

Lower Oligocene "c" stage	<u>Nummulites</u> <u>intermedius</u>	-	x	x	-
Eocene	<u>Nummulites</u> <u>Discocyclus</u> <u>Actinocyclus</u> <u>Pellatispira</u>	x	x	-	x
Upper Cretaceous :	a. <u>Pseudorbitoides</u>	x	x	-	-
	b. <u>Globotruncana</u>	x	x	-	x

The Upper Cretaceous genus Pseudorbitoides was recorded by Glaessner (1950) from the Central Highlands, New Guinea and in 1952 from the Port Moresby area, Papua. In the Gulf of Mexico region it is confined to the Upper Senonian. Another Upper Cretaceous genus of importance is Globotruncana, of which two species have been identified, G.lapparenti and G.stuarti.

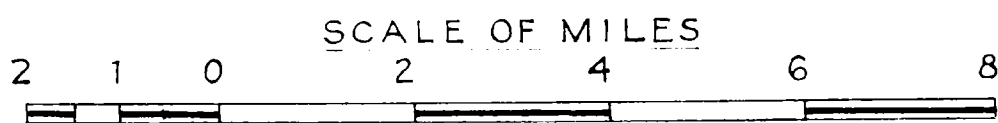
The characteristic Lower Oligocene, "c" stage, species Nummulites intermedius was first recorded from the Central Highlands in limestones collected by Dr. N. H. Fisher and reported upon by one of us (I.C.) on 6/6/40.

There is still some uncertainty in the determination of the age of some samples containing only planktonic species. This can be proved only by their association with rocks of known age.

REFERENCES

- GLAESSNER, M.F., 1950 - Report on the examination of rock samples from the Central Highlands. Island Exploration Co. Report (unpublished).
- _____, 1952 - Geology of Port Moresby, Papua. Mawson Anniv. vol. Univ. Adelaide, 63-86.

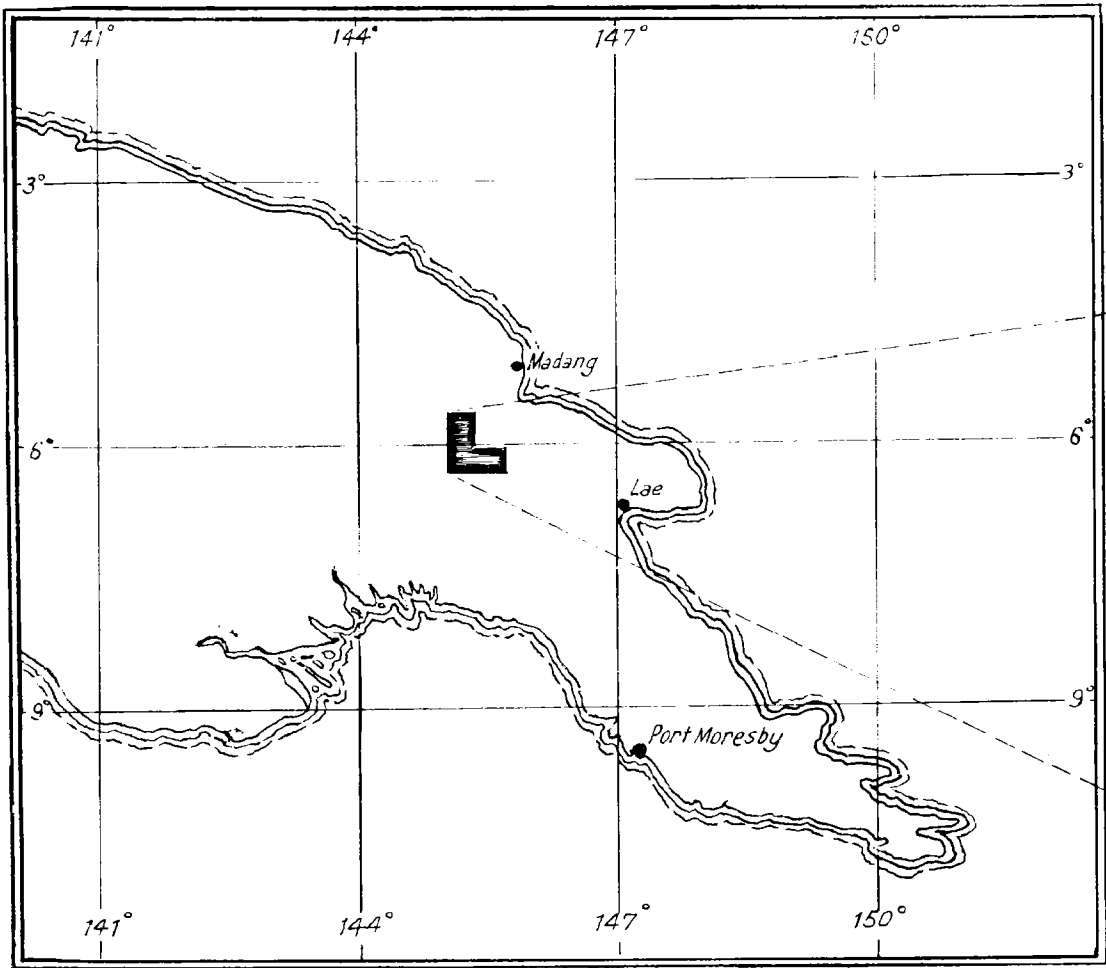
CENTRAL HIGHLANDS
NEW GUINEA
LOCALITIES OF SAMPLES



Reference

- 3M8a Location and sample number.
- Vehicle road
- A/D Aerodrome
- L.G. Airplane landing ground
- P.P. Patrol posts.
- CENOZOIC - TERTIARY
- Tp Sandy limestone
- Tmfi-f2v Basic volcanics
- Tmfi-fz Grey shale with limestone lenses
- MESOZOIC - UPPER CRETACEOUS
- Ku Limestone and grey shale
- PALAEOZOIC (?)
- Pz Metamorphics
- W.B. Wilhelm batholith
- Geological boundary (approximate)
- Fault, position accurate, position approximate, probable fault.

LOCALITY MAP



OBULU	ONE-MILE MAP SERIES
TORO	
CHUAUE	BENA BENA

